Searching for the National Interest, and Finding a Biogas Highway

AgSTAR 2013 presentation by
Jim Lemon, developer of SSEV-1, an "all of the above"
energy vehicle

SSEV: Stands for "Secure and Sustainable Energy Vehicle."

- "Secure" because it does not require oilbased fuel, but <u>can</u> run on it.
- "Sustainable" because it can run on energy from multiple sources that produce fewer emissions and/or are renewable.

Motive for development of SSEV-1: To address the real "National Interest" question raised by the Keystone XL pipeline debate:

What can we do to eliminate our "oil above all" transportation energy dilemma and give drivers true consumer choice when purchasing energy to power their vehicles?

Desired outcome: An inexpensive "all of the above" energy vehicle that:

- Utilizes the cheapest and cleanest energy available – waste heat from braking;
- Is able to run on publicly available liquid fuel, compressed gas and electricity;
- Has at least a normal driving range;

- Does not require unique or lengthy refueling or recharging processes;
- Can cover the average vehicle trip (12 miles) on electricity alone;
- Eliminates driver's total dependence on oil-based fuels and fossil fuels.

One other thing: My wife had to be able to drive it like a normal car. She refused to make her own fuel...



and she nixed these ...





and these ...





End Result: A plug-in, bi-fuel, hybrid electric vehicle that:

- can be powered by energy from at least fourteen different sources;
- can travel 680 miles without stopping and be quickly refueled;
- cost \$21,000 to develop (\$10K for used car, \$6K for bi-fuel CNG conversion, \$5K for plug-in conversion)









SSEV-1 compressed gas options:

- Renewable biogas from farms/dairies
- Renewable biogas from bio-digesters
- Renewable biogas from wastewater treatment plants
- Renewable biogas from landfill gas collection systems
- Natural gas from gas wells

SSEV-1 electricity options:

- Renewable hydro electricity
- Renewable solar electricity
- Renewable wind electricity
- Renewable biogas electricity

SSEV-1 electricity options: (continued)

- Electricity from nuclear power
- Electricity from natural gas
- Electricity from natural coal

SSEV-1 liquid fuel options:

- Gasohol (gasoline/renewable alcohol mix 90/10 mix)
- Gasoline

Discovery of the Washington, D.C. to Chicago "biogas highway."

- At time of first SSEV-1 road trip (October 2012), I had no knowledge of publicly available biogas.
- DOE alternative fuel website <u>did not</u> and <u>does not</u> identify biogas refueling station locations.

Discovery of the D.C. to Chicago biogas highway. (continued)

Huge surprise on my first SSEV-1 road trip:

The hunt for PLAIN OLD NATURAL GAS led to *Beautiful Biogus* at multiple public refueling stations between D.C. and Chicago!

Discovery of the Washington, D.C. to Chicago biogas highway. (continued)

Biogas for sale NOW on the highway between our nation's capital and Chicago:

- Washington, PA ("B" on map)
- Zanesville, OH ("C")
- Columbus, OH ("D")
- Fair Oaks, IN ("E")

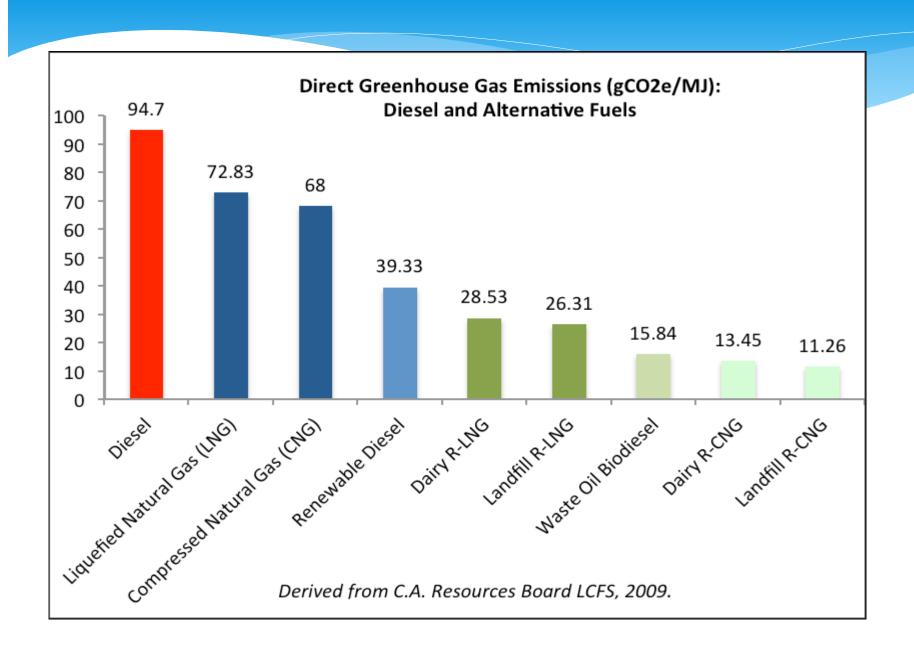




Filling up the SSEV-1 with beautiful biogas at Quasar bio-digester in Zanesville, OH

SSEV-1 performance on the D.C. to Chicago "biogas highway."

- SSEV-1 can travel over half of 1,500 mile round trip on biogas -- with just a 2.6 GGE compressed gas tank.
- At \$2.25 per GGE, SSEV-1 cost of biogas is about 4.6 cents per mile, at 60-65 mph / 50 mpg highway driving.



To complete a D.C. to Chicago biogas highway, refueling stations are needed:

- In/around Washington, D.C.
- About halfway between D.C. and Washington, PA
- In/around Indianapolis
- In/around Chicago

Target market: "green" motorists and firms who:

- Want to escape oil-based fuels but are concerned about EV viability and fracking;
- Live/work or are located in or near biogas stations on proposed biogas highways;
- Believe the proliferation of biogas
 production and use <u>across this land</u> would
 indisputably be in the National Interest.

A Biogas Highway would:

- Be the greenest road trip in the nation.
- Serve as a showcase for biogas as the premium publicly available vehicle fuel.
- Publicize this fact: unlike any other publicly available vehicle fuel, the cumulative environmental impact of biogas production and use is positive.

Beautiful Biogas – renewable, convertible, versatile, scalable, storable, plentiful, environmental, mobile, <u>local</u> …







... and the best way to put the sun's energy into the automobile.